MONITORING PLAN

PROJECT NO. AT-03 BIG ISLAND MINING

ORIGINAL DATE: June 26, 1996
REVISED DATE: July 23, 1998

Preface

Pursuant to a CWPPRA Task Force decision on April 14, 1998, the original plan was modified. Specifically, one additional pre-construction photography was obtained due to delays in construction timetables.

Project Description

The proposed project area is located in the northwestern region of the Atchafalaya delta and is bounded by Shell Island and Shell Island Pass to the north and west, Ameranda Pass to the south, and the Atchafalaya Bay Channel to the east and southeast. The project is located within the Atchafalaya Delta Wildlife Management Area in the southeast corner of St. Mary Parish, LA. (figure 1). The Atchafalaya delta is a part of the Atchafalaya Bay delta complex, which also includes the Wax Lake delta located in western Atchafalaya Bay. The Atchafalaya delta and the Wax Lake delta formed in the shallow Atchafalaya Bay between the mouth of the Atchafalaya River navigation channel and the Point Au Fer shell reef. The Atchafalaya River has been a distributary of the Mississippi River since the 1500s and is typical of diversion or capture of mainstream flow by a distributary (van Heerden and Roberts 1980). In 1963 the Old River control structure was completed by the U.S. Army Corps of Engineers (USACE) and has since maintained the flow of the Atchafalaya River at the historical rate of 30% of the combined flow of the Mississippi and Red Rivers (Louisiana Coastal Wetlands Conservation and Restoration Task Force 1993).

A subaqueous delta began to form at the mouth of the Atchafalaya River between 1952 and 1962 with the introduction of silts and fine sands to the bay. Prior to 1952, the lakes and bays within the Atchafalaya Basin floodway system, north of the Atchafalaya Delta, filled with sediment. Only prodelta clay deposition was occurring in the Atchafalaya Bay due to contact with higher salinity waters (Louisiana Coastal Wetlands Conservation and Restoration Task Force 1993). From 1962 to 1972 coarser materials began to be deposited into the Atchafalaya Bay and a period of distal bar and subaqueous bar accretion occurred (van Heerden and Roberts 1980). The spring flood of 1973 produced the first subaerial growth of the Atchafalaya Delta on both sides of the navigation channel with a total area of 1.95 mi^2 (5.1 km^2). During the progradational phase of delta growth, which occurred between 1973 and 1976, deposition of coarse sediment accounted for growth of new land at an average rate of 2.05 $mi^2\ yr^{-1}$ (5.3 $km^2\ yr^{-1}$). From 1977 to 1990 (a period of channel abandonment and lobe fusion) growth occurred at an average of 0.75 $mi^2\ yr^{-1}$ (1.9 $km^2\ yr^{-1}$) to form its present subaerial expression of 11.31 mi^2 (29.4 km^2)(van Heerden et al. 1991).

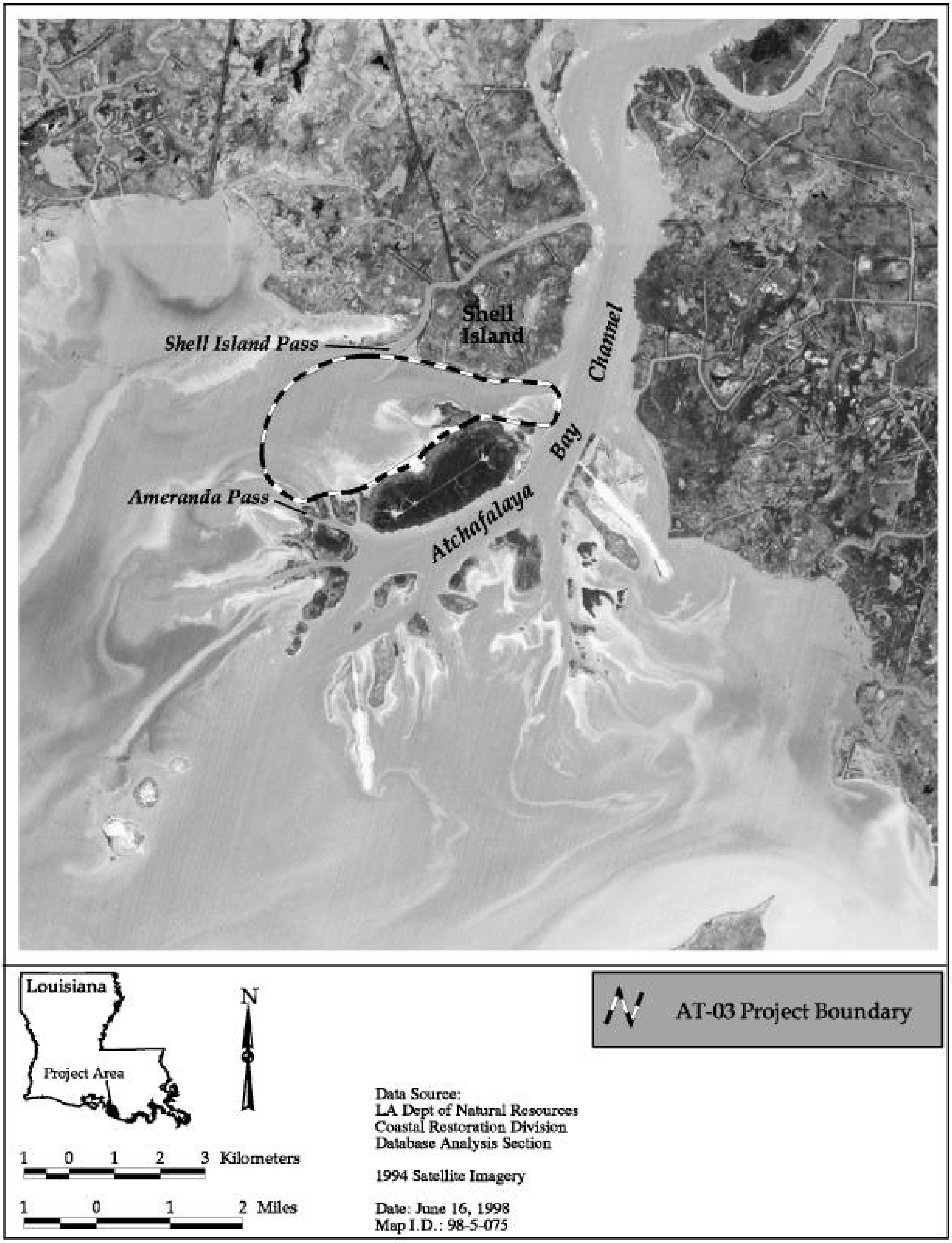

Figure 1. Big Island Mining (AT-03) project area.

The general pattern of vegetation in the area is affected by delta formation, seasonal changes, and elevation. Three vegetation associations occupy 93% of the vegetated area of natural islands within the Atchafalaya delta (Johnson et al. 1985). Woody vegetation, mostly *Salix nigra* (black willow), covers 19% of the vegetated areas and generally occurs on the upstream end of delta lobes and along the leading edge where elevation is highest and sand content is greatest. The *Typha* association covers 10% of the vegetated areas and occurs at intermediate elevations and includes species such as *Typha latifolia* (broadleaf cattail), *Cyperus difformis* (cyperus), *Eleocharis* spp.(spikerush), *Scirpus americanus* (three-cornered grass), *Scirpus validus* (softstem bullrush), and *Ammannia coccinea* (ammannia). The *Sagittaria* association includes species such as *Sagittaria latifolia* (duckpotato), *S. platyphylla* (delta duckpotato) and *Scirpus americanus*. This association is most extensive covering 64% of the vegetated areas of natural delta islands and occurs at the lowest intertidal elevations. Submerged aquatics form a secondary association that occurs at the downstream ends of islands with the lowest elevations (Louisiana Coastal Wetlands Conservation and Restoration Task Force 1993). Herbivory by nutria (*Myocastor coypus*) and muskrat (*Ondatra zibethicus*) has been reported for islands in the Atchafalaya Delta (Fuller et al. 1985, Shaffer et al. 1992). Biomass of duckpotato and ammannia was higher within mammal exclosures than outside of the exclosures and plant species composition within the Atchafalaya delta has been shown to be affected by herbivory (Fuller et al. 1985).

The Atchafalaya delta is bisected by the Lower Atchafalaya River navigation channel which is maintained by the USACE for navigational purposes. Dredged material on the channel banks and increased channel depth have created unnatural conditions forming an efficient conduit for river sediment to the Gulf of Mexico. Spoil material deposited along the western portion of the navigation channel formed Big Island (figure 2). This 2 mi (3.2 km) long island effectively limits westward flow of sediment rich Atchafalaya River water (van Heerden 1983). A comparison can be made between the Atchafalaya delta and the Wax Lake delta to the west. Dredging ceased on the Wax Lake Outlet in 1980 and this delta has been building naturally since that time.

The Big Island Mining project (AT-03) is designed to enhance natural delta building processes by creating an avenue for sediment transport to areas north and west of Big Island. The project consists of dredging a 21,000 ft (6.4 km) secondary distributary channel from the Atchafalaya River along the northern side of Big Island with four smaller tertiary distributary channels to emulate an emerging delta. The main distributary channel starts with a bottom width of 800 ft (244 m) at elevation -20.0 ft (-6.1 m) National Geodetic Vertical Datum (NGVD) and reduces to 400 ft (122 m) bottom width at elevation -10.0 ft (-3 m) NGVD to create a venturi effect to accelerate flow and keep sediment in suspension (figure 3). A total of 3.34 million cu yd (2.54 million m^3) of dredged material will be placed in 11 dredge disposal areas at elevations between +3.0 ft and +1.5 ft (+0.9 and +0.45 m) NGVD (figure 3). Approximately 850 ac (340 ha) of wetlands will be created and approximately 3 ac (1.2 ha) will be lost for a net gain of approximately 847 ac (339 ha) of wetland (Mayer, et al. 1995). Additional wetlands are expected to result from natural delta-building processes associated with the new distributary channels.

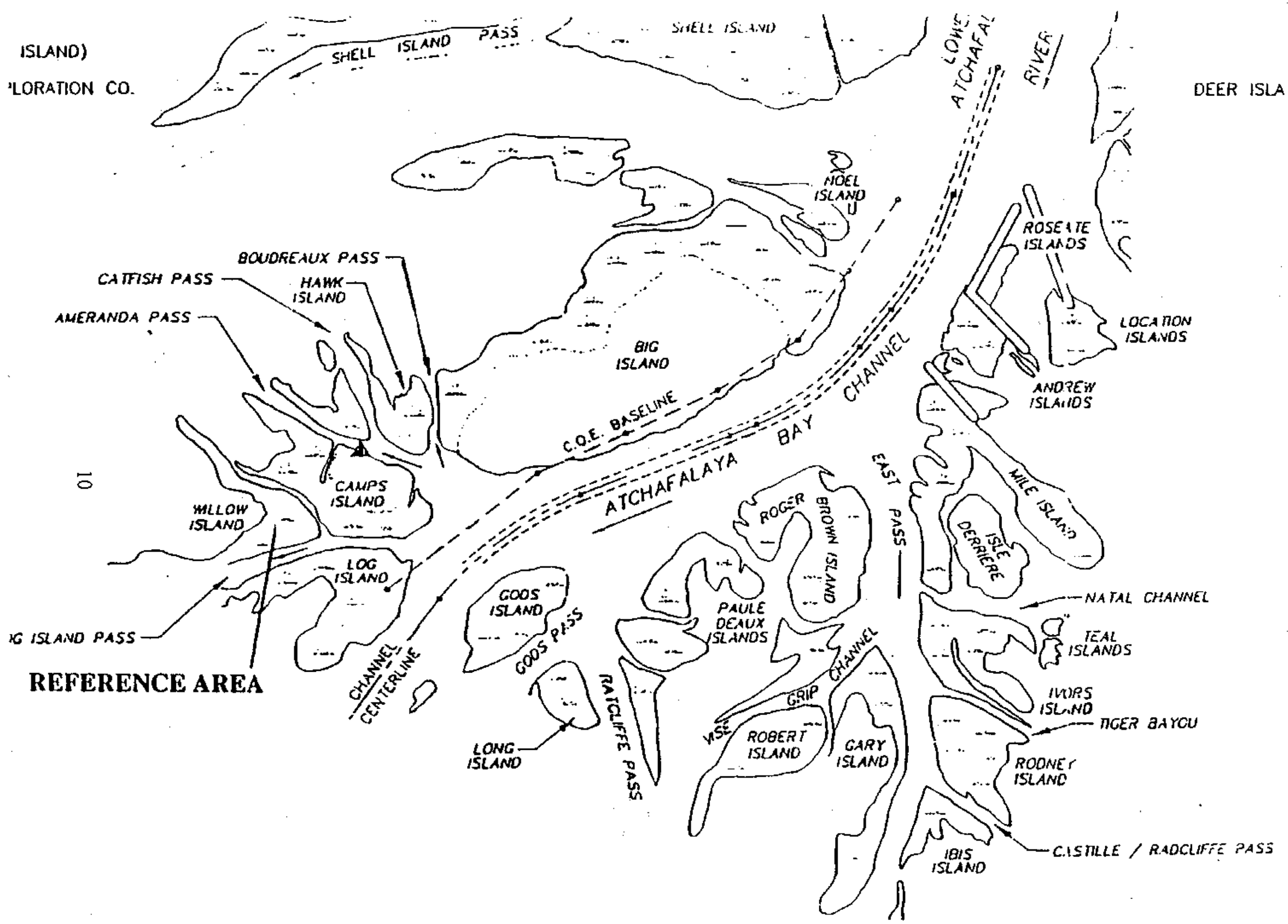

Figure 2 Islands of the Atchafalaya Delta.

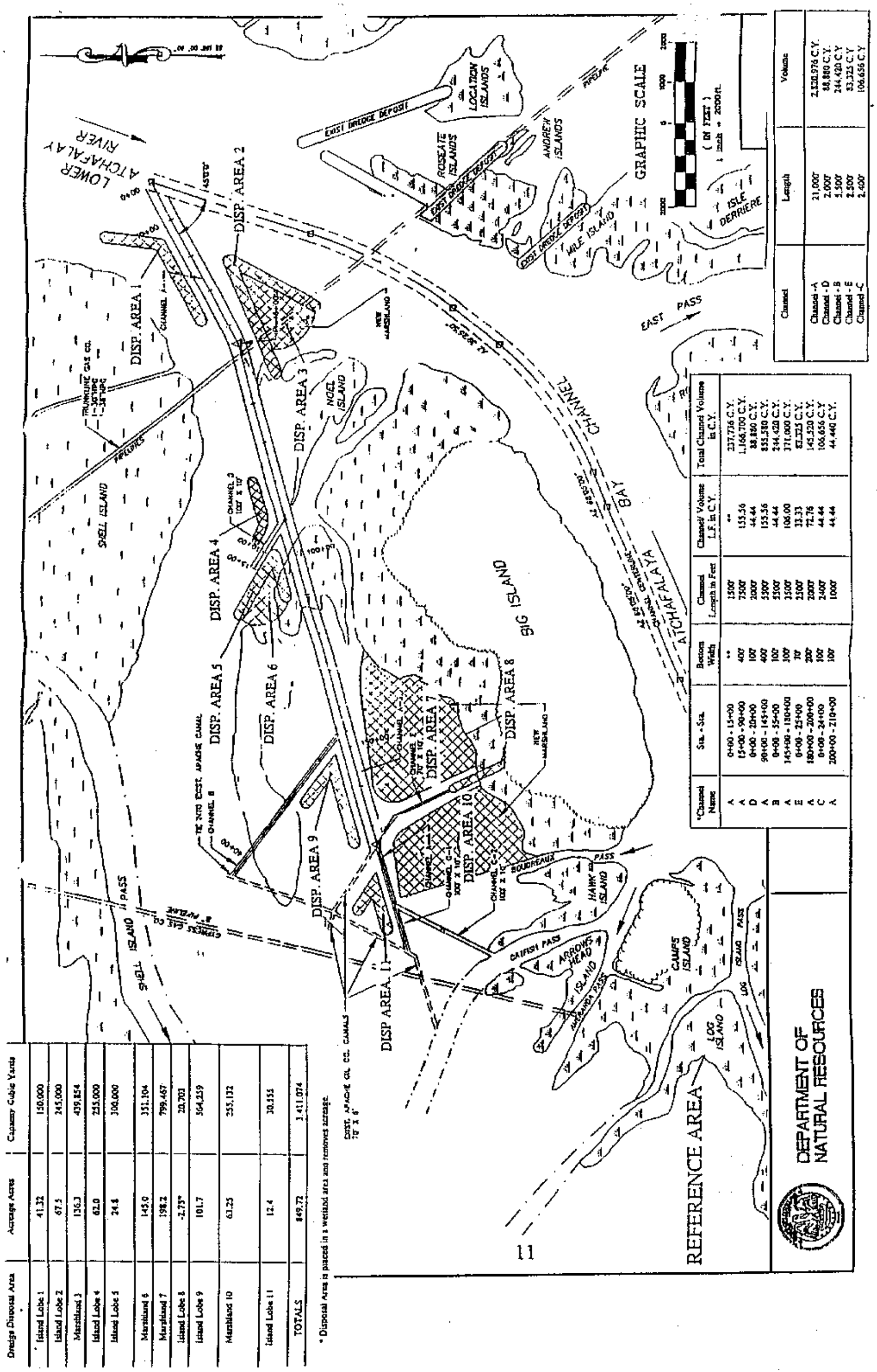

Figure 3 The Big Island Mining (AT-03) project.

Project Objectives

1. Establish a sediment delivery system in the western portion of the Atchafalaya delta, thereby enhancing the system's natural delta-building potential.

2. Utilize dredged material from the creation of the distributary channels to create delta lobe islands suitable for establishment of emergent marsh.

Specific Goals

The following goals will contribute to the evaluation of the above objectives:

1. To increase the project areas delta-building potential through the establishment of effective distributary channels.

2. Create approximately 850 ac (340 ha) of delta lobe islands through the beneficial use of dredged material at elevations suitable for emergent marsh vegetation.

3. Increase the rate of subaerial growth in the project area to that measured from historical photography since 1956 within the project area.

Reference Area

A reference area was chosen to compare vegetative communities and elevation between the newly created lobe islands and a naturally formed lobe island. The evaluation of possible reference areas was based on aerial photography and site investigations. Areas were ranked on the basis of their proximity to the project, elevation, plant communities, and the possible future use as a dredged material disposal area. Ibis Island, Ivor's Island, Roger Brown Island, Isle Derriere, Hawk Island, Arrowhead Island, Log Island, Willow Island, and islands in the Wax Lake delta were considered as potential reference areas. Many of these will likely be impacted by the project or through future dredging activities in the navigation channel. Willow Island (figure 2) was chosen as the reference area for the following reasons: (1) it is not designated as a dredged material disposal area, (2) it is at an elevation close to that of the newly created lobe islands, (3) it appears it will experience the least impact due to the project, and (4) it will be exposed to the same tidal influences and similar flow regimes as the project area. Additionally, vegetative communities on the island are typical of lobe islands within the Atchafalaya delta. However, we recognize that in this dynamic environment interpretation of reference data may be limited or confounded by natural physical processes.

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1. Habitat Mapping — To document vegetated and non vegetated areas, color-infrared aerial photography (1:12,000 scale with ground control markers) will be obtained. The photography will be georectified, photointerpreted, mapped, and analyzed with GIS by National Wetlands Research Center (NWRC) following procedures outlined in Steyer et al. (1995). Photography will be obtained twice prior to construction in 1994 and 1997, and two times following construction in 2000 and 2007 in lieu of photography available from other sources.

2. Vegetation — Species composition and relative abundance will be evaluated at each station utilizing the Braun-Blanquet method (Mueller-Dombois and Ellenberg 1974) as described in Steyer et. al. (1995). Transects will be delineated at disposal areas 5, 6, and 7 (figure 3) and at the reference area (figure 2) so that each habitat type will be included. Vegetation transects will be sampled post-construction in 1999, 2002, 2007, and 2016.

3. Elevation — Elevations will be surveyed to existing benchmarks according to Steyer et al. (1995) along transects on disposal areas 5, 6, and 7 and the reference area. The elevation transects will coincide with vegetational transects in each area. Elevations will be recorded as-built, and in 1999, 2002, 2007, and 2016.

4. Bathymetry — Benchmarks will be installed at the time of construction and tied to NGVD at three stations (head, midway, mouth) along each dredged distributary channel. Bathymetry will be evaluated at each station using a Fathometer and positioning equipment. The equipment will be calibrated before use following the manufacturer's guidelines. Positioning will be recorded in x-y coordinates, and depth will be recorded in feet. Shallow water bodies (inaccessible by boat) will be surveyed using topographic land surveying techniques. Water levels at each site will be related to a fixed datum and all bathymetric surveys will be referenced to the same water-level datum. Bathymetric profiles will be recorded as-built, and in 1999, 2002, 2007, and 2016 post-construction.

<u>Anticipated Statistical Analyses and Hypotheses</u>

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goals.

1. Descriptive and summary statistics as well as t-tests on historical data and data from aerial photography and GIS interpretation collected during post-project implementation will be used

to evaluate marsh loss/gain rates within the project and reference areas. Also, historical values for the area as well as data available from other surveys (USACE, USFWS, LDNR, LSU) will be gathered to document and allow for statistical analysis of long term marsh loss/gain rates in the project area.

Goal: Create delta lobe islands.

Hypothesis:

H_0: Land gain in the project area will not be significantly greater than land gain in the reference area at time i.

H_a: Land gain in the project area will be significantly greater than land gain in the reference area at time i.

2. The primary method of analysis will be to determine differences in relative abundance of vegetation as evaluated by an analysis of variance (ANOVA) that will consider *both* spatial and temporal variation and interaction. The ANOVA approach may include terms in the model to adjust for station/transect locations, proximity to the distributary channels, and seasonal fluctuations. Ancillary data (ie. herbivory, historical) will be included as covariables when available. This additional information may be evaluated through analysis such as: correlation, trend, multiple comparisons, and interval estimates.

Goal: Create delta lobe islands in which the relative abundance of vegetation is similar to that of natural lobe islands.

Hypothesis:

H_0: Mean relative abundance of vegetation within the project area will not be significantly different than the mean relative abundance of vegetation within the reference area at time i.

H_a: Mean relative abundance of vegetation within the project area will be significantly different than the mean relative abundance of vegetation within the reference area at time i.

If we reject the null hypothesis, any possible negative effects will be investigated.

3. Descriptive and summary statistics and t-tests will be used to evaluate elevation and elevational changes of the created and natural delta lobe islands.

Goal: Create delta lobe islands in which the elevations will be similar to that of naturally occurring delta lobe islands (reference area).

Hypothesis:

H_0: Elevation of the created delta lobe islands will not be significantly different than the elevation of the reference area at time i.

H_a: Elevation of the created delta lobe islands will be significantly different than the elevation of the reference area at time i.

If we reject the null hypothesis, any possible negative effects will be investigated.

4. Descriptive and summary statistics will be used on bathymetric data collected during post-project implementation to determine how and/or if the cross-sectional area of dredged distributary channels within the project area are changing over time.

   Goal: Create functioning secondary and tertiary distributary channels.

NOTE: Available ecological data, both descriptive and quantitative, will be evaluated in concert with all of the above data and with statistical analyses to aid in determination of overall project success.

<u>Notes</u>

1.	Implementation:	Start Construction;	March 11, 1998
		End Construction:	September 1, 1998
2.	NMFS Point of Contact:	Terry McTigue	(318) 482-5915
3.	DNR Project Manager:	Van Cook	(504) 342-6814
	DNR Monitoring Manager:	John A. Bourgeois	(504) 447-0994
	DNR DAS Assistant:	Chris Cretini	(504) 342-9435

4. The twenty year monitoring plan development and implementation budget for this project is $205,993. A progress report will be available in September 2000 and comprehensive reports will be available in September 2003, September 2008 and September 2018. These reports will describe the status and effectiveness of the project.

5. DNR/CRD has prints of near-vertical aerial photography flown in 1985 (1:64,000), October 5, 1991 (1:12,000), and on December 17, 1994 (1:12,000). The Army Corps of Engineers proposes annual habitat mapping at the Lower Atchafalaya River Bay and Bar navigation channel.
6. Final estimates for wetland acreage created, destroyed, and enhanced through this project will be obtained from the Final Engineering and Design Report.

7. A fisheries monitoring and analysis plan is being developed and funded by NMFS.

8. References:

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